

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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**MULTIMEDIA UNIVERSITY**

**FINAL EXAMINATION**

**TRIMESTER 1, 2016/2017**

**DET5058 – DIGITAL ELECTRONICS**  
(All Groups)

12 OCTOBER 2016  
9.00 a.m – 11.00 a.m  
(2 Hours)

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**INSTRUCTION TO STUDENT**

1. This question paper consist of 6 pages (5 pages for questions and 1 page for appendix).
2. Answer **ALL** question.
3. Please write all your answers in the answer booklet provided.

**QUESTION 1 [25 MARKS]**

- a) Explain **analog representation** and **digital representation** as the ways to represent the numerical values of quantities.

[2 marks]

- b) State **two** disadvantages of digital systems.

[2 marks]

- c) Convert the following numbers.

- i.  $1387_{10}$  to binary

[2 marks]

- ii.  $547_8$  to hexadecimal

[2 marks]

- iii.  $703D_{16}$  to octal

[2 marks]

- d) Solve the following signed number calculation in the 2's complement form.

- i.  $10001100_2 \times 00111001_2$

[5 marks]

- ii.  $25_{10} \div -5_{10}$

[5 marks]

- iii.  $23_{16} + (-1A)_{16}$

[5 mark]

**Continued...**

**QUESTION 2 [25 MARKS]**

a) State the Boolean expression for output  $X$  for each circuit in Figure 1.

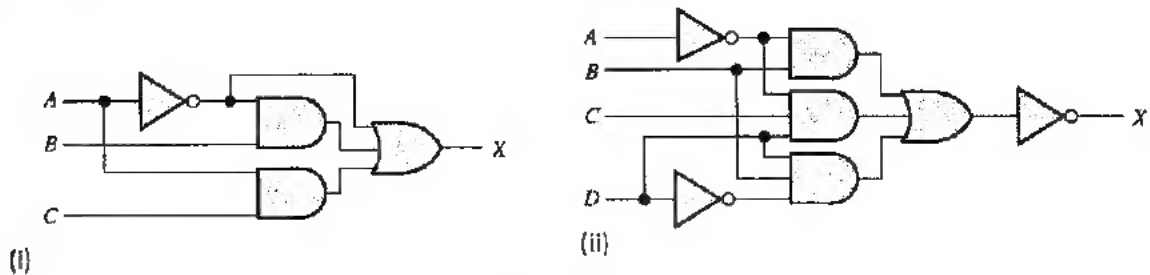


Figure 1

[4 marks]

b) Given  $\overline{A \oplus B + B} + AC + (A + D)$ .

i. Draw the logic circuits.

[5 marks]

ii. Complete the truth table in Table 1 below.

[8 marks]

A	B	C	D	$\overline{A \oplus B + B}$	$AC$	$(A + D)$	OUTPUT
0	0	1	0				
0	1	0	1				
				(2 m x2)	(1m x2)	(1m x2)	(1m x2)

Table 1

c) Simplify the following Boolean expressions using Boolean simplification, then draw the circuit of simplified expression:

i.  $(A + C)(AD + \overline{AD}) + AC + C$

[4 marks]

ii.  $\overline{ABC} + \overline{ABC} + \overline{ABC} + \overline{ABC} + ABC$

[4 marks]

Continued...

**QUESTION 3 [25 MARKS]**

a) Draw the logic circuit for  $AB + C$  using NAND gate only.

[4 marks]

b) Given  $\overline{ABC} + AB + \overline{ABC}$  :

i. Find the standard SOP.

[2 marks]

ii. Draw the truth table from this standard SOP.

[2 marks]

iii. Write the equivalent POS.

[2 marks]

iv. Draw the Karnaugh map for the expression.

[3 marks]

v. Find the minimum SOP.

[3 marks]

c) Given truth table as Table 2. Find the minimum SOP using K-Map.

[9 marks]

A	B	C	D	OUTPUT
0	0	0	0	0
0	0	0	1	1
0	0	1	0	X
0	0	1	1	1
0	1	0	0	0
0	1	0	1	X
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X

Table 2

**Continued...**

**QUESTION 4 [25 MARKS]**

a. Define decoder.

[2 marks]

b. Design a decoder that can decode input 1111 into LOW output with limitation using only a unit of NOT gate and a unit of AND gate.

[5 marks]

c. How to make the design in question 4(b) produce HIGH input if you are only allowed to change one gate only?

[2 marks]

d. Construct the truth table for 4 data input multiplexer with 2 data selector.

[4 marks]

e. Draw the logic circuit for half-adder with 2 inputs. Given to you the half adder truth table as in Table 3

A	B	$C_{out}$	$\Sigma$
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

Table 3

[5 marks]

f. Determine the sum and output carry for a full-adder with  $C_{in} = 0$ ,  $A = 1$  and  $B = 0$ .

[3 marks]

g. Complete the truth table for active-High S-R latch.

[2 marks]

S	R	Q	$\bar{Q}$
0	0	i.	NC
0	1	ii.	iii.
1	0	1	0
1	1	iv.	1

Table 4

h. State one of the applications of flip-flops.

[2 marks]

**End of Page.**

**APPENDIX: RULES OF BOOLEAN ALGEBRA**

1.  $A + 0 = A$
2.  $A + 1 = 1$
3.  $A \cdot 0 = 0$
4.  $A \cdot 1 = A$
5.  $A + A = A$
6.  $A + \overline{A} = 1$
7.  $A \cdot A = A$
8.  $A \cdot \overline{A} = 0$
9.  $\overline{\overline{A}} = A$
10.  $A + AB = A$
11.  $A + \overline{A}B = A + B$
12.  $(A + B)(A + C) = A + BC$